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THE AMARANTHACEAE OF THE GALAPAGOS ISLANDS

BY

JOHN THOMAS HOWELL

Assistant Curator, Department of Botany
California Academy of Sciences

INTRODUCTION

Several months have been spent in the study of the *Amaranthaceae* of the Galapagos Islands; and, because of the difficulty encountered in the limitation of many of the species and because in nearly all of the genera new names are being proposed, it has appeared best to present the results in a synoptical study of the family as it occurs in the archipelago. Moreover, a special interest attaches itself to this family because of its highly endemic development in the islands. The study was begun when a determination of the extensive collections made by the writer on the Templeton Crocker Expedition of the California Academy of Sciences was attempted. This collection and the material obtained by the expedition of the Academy to the Galapagos Islands in 1905 and 1906 formed the basis for the study. From the Gray Herbarium of Harvard University, critical specimens of Galapagian *Amaranthaceae*, including numerous types and isotypes from the collections of Andersson, Baur, and Snodgrass and Heller, were available for study. From the United States National

Herbarium and from the Field Museum, specimens of *Amaranthus* were borrowed; and from the Herbarium of the University of California specimens of *Alternanthera ficoidea* from South America were studied. Specimens obtained in the Galapagos Islands by Snodgrass and Heller on the Hopkins-Stanford Galapagos Expedition were available from the Dudley Herbarium of Stanford University. To the officers of these institutions, the writer expresses grateful appreciation for the privileges he has enjoyed in studying the specimens. Particular thanks are due to Dr. B. L. Robinson and to Mr. C. A. Weatherby of the Gray Herbarium who have been helpful in many ways, to Dr. Paul C. Standley of the Field Museum who determined several species of *Amaranthus* and answered questions concerning others, to Dr. H. K. Svenson of the Brooklyn Botanic Garden who loaned specimens and notes on *Alternanthera*, and to Miss Ruth D. Sanderson, Librarian, Gray Herbarium, who has sent transcripts of early descriptions and photographs of figures. Distributional data for species extending beyond the Galapagos Islands have been obtained almost entirely from Standley's work on the *Amaranthaceae* in the North American Flora (21: 95-169. 1917). Except in the genus *Alternanthera* in which only type collections and specimens examined are cited, all collections that have been reported from the island for the family are listed. An exclamation point follows the collector's name if a specimen has been examined.

Key to the Genera

a. Leaves alternate; anthers 4-celled.
  b. Shrub, about 1 m. tall; fruit a many-seeded berry...1. Pleuropetalum
  bb. Annual herbs; fruit a 1-seeded utricle.....2. Amaranthus
aa. Leaves opposite; anthers 2-celled; perennials.
  c. Perianth-segments distinct or nearly so, not becoming modified in fruit.
    d. Heads numerous and small, disposed in an open panicle; perianth terete; anthers 5; stigma 2-3-lobed.....3. Iresine
    dd. Heads fewer and larger, these solitary or glomerate, terminal or axillary; perianth generally compressed.
      e. Leaves mostly basal, more or less crowded on the crown of the thick vertical root; anthers 2, staminodia 3, pseudostaminodia lacking; stigma 2-lobed.....4. Lithophila
      ee. Leaves cauline; stamens with anthers 5.
        f. Leaves rigid, pungently mucronate; pseudostaminodia none; stigma 2-lobed.....5. Philoxerus
        ff. Leaves herbaceous or coriaceous, not pungently mucronate; pseudostaminodia 5; stigma capitate.....6. Alternanthera
  cc. Perianth-segments united at least to the middle into a tube, the tube becoming hardened and variously modified in fruit.....7. Froelichia

1. PLEUROPETALUM Hook. f.

Pleuropetalum Darwinii Hook. f.,
London Jour. Bot. 5: 108 (1846)

Type locality. James Island.

Insular distribution. Albemarle: Iguana Cove, *Snodgrass & Heller;* Villamil, *Stewart!* James: *Darwin; Stewart!*

Endemic.

2. AMARANTHUS L.

Key to the Species

a. Perianth-segments 1–5, generally 3, oblong to oblanceolate, never spathulate-expanded, rarely corky-thickened at base.

b. Utricle dehiscent (*Amaranthus* proper).

c. Spines lacking.

d. Sepals shorter than utricle; bracts usually shorter than the sepals.

e. Stems erect; flowers nearly confined to terminal inflorescence.....1. *A. dubius*

ee. Stems diffuse; flowers common in axillary clusters below the terminal inflorescence..2. *A. celosioides*

dd. Sepals longer than utricle; bracts longer than the sepals.....3. *A. quitensis*

cc. Spines present at nodes and in inflorescence.....4. *A. spinosus*

bb. Utricle indehiscent (*Euxolus*).

f. Stems mostly erect or spreading; leaves broad.

g. Utricle smooth; stems spreading.....: .....5. *A. viridis*

gg. Utricle rugulose; stems erect.....6. *A. gracilis*

ff. Stems prostrate, rarely ascending; leaves linear.

h. Sepals 3–5; utricle buff or brown.....7. *A. sclerantoides*

hh. Sepal 1; utricle black-brown.....8. *A. furcatus*

aa. Perianth-segments spathulate, the blade largely scarious, in fruit becoming indurated at the base or coalescing below into a thickened spongy cushion (*Amblogyna*).

i. Stems erect, glabrous; leaves linear to narrowly lanceolate; cymules becoming elongate; base of bracts becoming thickened in fruit; base of perianth-segments scarcely spongy-coalescing, more indurated and nearly distinct.....9. *A. squamulatus*

ii. Stems spreading or erect, villous; leaves elliptic to obovate; cymules condensed, not elongating; bracts unchanged in fruit; base of perianth-segments coalescing to form an enlarged spongy base in fruit.....10. *A. Andersson*

1. **Amaranthus dubius** Mart.,
Pl. Hort. Erlang. 197 (1814)

A. caracasanus of reports on the Galapagian flora, perhaps *A. caracasanus* HBK., Nov. Gen. & Sp. 2: 195 (1817).

The species was named from cultivated plants originating in tropical America.

Insular distribution. Albemarle: southern part, *Baur;* Tagus Cove, *Snodgrass & Heller;* Villamil, *Stewart!*, *Howell!;* Cowley Bay, *Stewart!* Charles: *Darwin; Andersson; Snodgrass & Heller; Stewart!* Chatham: *Andersson; Snodgrass & Heller;* Wreck Bay, *Stewart!*, *Howell!* Hood: Gardner Bay, *Howell!* Indefatigable: *Andersson;* Academy Bay, *Stewart!;* Conway Bay, *Howell!* James: James Bay, *Howell!*

Further distribution. Widespread as a weed in tropical America.

2. **Amaranthus celosioides** HBK.,
Nov. Gen. & Sp. 2: 194 (1817)

This can be distinguished from *A. dubius* Mart. by the spreading habit, the stouter terminal inflorescence, and the axillary flower-clusters which extend to the base of the plant. In the Galapagos Islands, *A. celosioides* was reported by Hooker f. and by Andersson from Charles Island (*Darwin*, *Andersson*) and from Chatham Island (*Andersson*). No specimen of this species has been seen in the collections of *Amaranthus* from the islands, but, since the plant is one of the common species of northern South America, it is to be expected on the islands as a weed about dwellings and in cultivated ground. *Amaranthus celosioides* was first described from plants collected at Cumana, Venezuela.

3. **Amaranthus quitensis** HBK.,
Nov. Gen. & Spec. 2: 194 (1817)

Type locality. Near Quito, Ecuador.

Insular distribution. Albemarle: Iguana Cove, *Snodgrass & Heller!*, *Stewart!*, *Howell!* Charles: *Stewart!;* Post Office Bay, *Howell!;* Black Beach, *Howell!* Indefatigable: Sierra la Jacres, *Rorud;* Turtle Bay, *Rorud.*

Further distribution. Northern South America; introduced into Europe.

Standley, who examined the specimens collected by the writer, and Blom, who examined the specimens collected by Rorud, refer the plants to a form of *A. quitensis* HBK. as that species is interpreted by Thellung in Ascherson and Graebner's Synopsis der Mit-

teleuropaischen Flora, a form with bracts shorter than in the type. The collections by Snodgrass and Heller (*No. 77* and *108*) and by Stewart (*No. 1355*) are placed here, but the specimens are very immature and possibly should be referred to *A. dubius* Mart.

4. **Amaranthus spinosus** L., Sp. Pl. 991 (1753)

Type locality. India.

Insular distribution. ALBEMARLE: Villamil, *Howell!* CHARLES: in cultivated ground, *Andersson.*

Further distribution. Tropical and subtropical Asia, Africa, and North and South America.

5. **Amaranthus viridis** L., Sp. Pl., ed. 2, 1405 (1763)

Type locality. Jamaica.

Insular distribution. ALBEMARLE: Villamil, *Stewart!*

Further distribution. Widespread in tropical and subtropical lands, occasionally adventive in temperate countries.

6. **Amaranthus gracilis** Desf., Tabl. Bot. 43 (1804)

Type locality. Guinea.

Insular distribution. BARRINGTON: *Snodgrass & Heller!* CHATHAM: Wreck Bay, *Stewart!* INDEFATIGABLE: Academy Bay, *Howell!*

Further distribution. Common in tropical regions around the world, occasionally adventive in temperate regions.

Here, too, probably belongs the collection of Snodgrass and Heller, made on Chatham Island and reported by Robinson as *A. viridis* L. The determination of the specimen from Academy Bay was confirmed by Standley.

7. **Amaranthus sclerantoides** (Ands.) Ands., Om Galap.-öarnes Veg. 59 (1857)

This *Amaranthus* is one of the plants characteristic of the lowlands of the Galapagos Islands in the vicinity of the shore, commonly growing in the higher reaches of bright calcareous beaches or a bit farther inland on sandy coastal flats. Only rarely was the species seen in the interior away from the sea.

Amaranthus sclerantoides presents several marked aspects because of the variation in leaf-shape, the leaves varying from linear and scarcely expanded at the apex to cuneate and rather widely dilated at the apex. When names were originally proposed for these forms, they were believed to be variants geographically isolated and were named for the islands where they were first collected. More recent and extensive field studies and collections have not only shown that the several forms are not confined to certain islands, but that they are dispersed through the archipelago and that occasionally several forms grow together in one colony. Thus at Academy Bay a form with gray-green, linear leaves grew with one marked by red-purple, cuneate leaves; on Tower Island the same pair occurred not far distant from each other, and at each locality no intergrades were seen.

There is also considerable variation in the development of spongy tissue at the base of the fruiting sepals and in the wrinkling of the utricle, variations which tend to be correlated. While all of the forms that have been named heretofore have been based on the striking foliar variations in the different plants, the form *rugulosus* is here proposed to take care of plants with sepals spongy at the base and with much-wrinkled utricles. There is some variation also in the length and width of the sepals, but generally the sepals equal or slightly exceed the utricle.

The seemingly artificial and deliberate segregation of the forms of this species in the key that follows belies the naturalness of the arrangement and the distinctive appearance of the segregates. As always in a key of this sort, care must be taken to distinguish between senescent plants and mature plants, and between puny starved seedlings and vigorous robust seedlings. The measurements in the key have been taken from the primary leaves of plants just reaching maturity.

KEY TO THE FORMS OF *A. sclerantoides*

a. Sepals not prominently corky-thickened at the base; utricle not prominently rugulose.

b. Leaves dilated at the apex, the primary leaves more than 1 mm. wide at apex, frequently emarginate, obcordate, or truncate.

c. Leaves 1–2 mm. wide, emarginate or obcordate.....7a. f. *typicus*

cc. Leaves 2–3 mm. wide, truncate or angularly obcordate.....7b. f. *chathamensis*

bb. Leaves not dilated at apex, the primary leaves mostly 1 mm. or less wide at apex, generally obtuse or truncate, rarely emarginate.....7c. f. *abingdonensis*

aa. Sepals in fruit rather prominently corky-thickened at the base; utricle rugulose.....7d. f. *rugulosus*

7a. **Amaranthus sclerantoides** f. **typicus** Howell, nom. nov.

Euxolus sclerantoides Ands., Stock. Akad. Handl. 163 (1854). *Amaranthus sclerantoides* Ands., Om Galap.-öarnes Veg. 59 (1857). *A. sclerantoides* f. *hoodensis* Rob. & Greenm., Amer. Jour. Sci. 50: 140 (1895).

Type locality. Charles Island.

Insular distribution. Albemarle: Villamil, *Howell!;* southwestern coast, *Howell!* Charles: *Andersson!*, the original collection; *Stewart!;* Post Office Bay, *Howell!;* Black Beach, *Howell!* Chatham: Wreck Bay, *Howell!* Gardner (near Hood): *Snodgrass & Heller!; Stewart!* Hood: *Baur!*, the original collection of f. *hoodensis; Snodgrass & Heller!* Indefatigable: Academy Bay, *Svenson!*, *Howell!;* Conway Bay, *Howell!* Narborough: east side, *Snodgrass & Heller!* South Seymour: *Svenson!; Howell!*

Endemic.

It does not appear that f. *hoodensis* can be well separated from the typical form, although f. *hoodensis* represents a variant with shorter and hence more obviously cuneiform leaves.

7b. **Amaranthus sclerantoides** f. **chathamensis** Rob. & Greenm., Amer. Jour. Sci. 50: 140 (1895)

A. sclerantoides f. *albemarlensis* Stewart, Proc. Calif. Acad. Sci., ser. 4, 1: 55, pl. 2, fig. 2 (1911).

Type locality. Southwestern end of Chatham Island.

Insular distribution. Albemarle: Turtle Cove, *Stewart!*, type collection of f. *albemarlensis.* Chatham: southwestern end, *Baur!*, original collection of f. *chathamensis;* Wreck Bay, *Stewart!*, *Howell!* Hood: Gardner Bay, *Howell!* Indefatigable: Academy Bay, *Svenson!*, *Howell!* Tower: *Svenson!; Wheeler, Rose & Beebe!;* Darwin Bay, *Howell!*

Endemic.

From an examination of the original collection of this form, it is believed to be a plant past maturity which in a younger state would be marked by leaves broadly dilated at the apex. The collections of the form obtained at Wreck Bay at the western end of Chatham Island add to the probability of this view. Stewart's form *albemarlensis* represents the extreme aspect of leaf-dilation in the species, but can scarcely be segregated from the series of variations referred to f. *chathamensis.*

7c. **Amaranthus sclerantoides** f. **abingdonensis** Stewart, Proc. Calif. Acad. Sci., ser. 4, 1: 54 (1911)

Type locality. Abingdon Island.

Insular distribution. ABINDGON: *Stewart!*, type collection. DAPHNE: *Wheeler, Rose & Beebe!* INDEFATIGABLE: Seymour Bay (north side), *Wheeler, Rose & Beebe!* TOWER: *Wheeler, Rose & Beebe!;* near Darwin Bay, *Howell!*, intergrade to f. *rugulosus*.

Endemic.

In the type collection the sepals are unchanged in fruit and the utricle is smooth; but, in the other specimens seen, there is a tendency for the sepals to become thickened at the base and for the utricles to become wrinkled.

7d. **Amaranthus sclerantoides** f. **rugulosus** Howell, f. nov.

Foliis linearibus, vix dilatis apice, truncatis emarginatisve, ad 3 cm. longis, 0.5–1 mm. latis; sepalis basi suberoso-crassiusculis; utriculis rugulosis.

Leaves linear, scarcely widened at the apex, truncate or emarginate, to 3 cm. long, 0.5–1 mm. wide; sepals becoming corky-thickened at the base; utricle rugulose.

Type: Academy Bay, Indefatigable Island, *Howell No. 9062* (C. A. S. Herb. No. 203292). Other collections. BARRINGTON: *Snodgrass & Heller!* TOWER: Arcturus Lake, *Howell!*

This form is a nominal indication of a variable tendency found in *A. sclerantoides*. In those forms characterized by leaves broadened at the apex, the tendency is not marked; but, in the forms with linear leaves, the tendency reaches a development which, in other parts of the genus, is used as an indicator of specific limits.

8. **Amaranthus furcatus** Howell, spec. nov.

Annuus; caulibus prostratis, angularibus, 1–2 dm. longis, glabris; foliis distichis, cineraceo-viridibus, 1–3.5 cm. longis, ad 3 mm. latis, basi sensim attenuatis, apice dilato, furcato, lobis divergentibus, costa prominenti infra, costis lateralibus tenuibus vel nullis; floribus monoeciis, in brevibus axillaribus spicis, rachibus suberoso-crassiusculis curvatisque fructu; bracteis lineari-lanceolatis, 1.5 mm. longis, longioribus quam flores; sepalo 1, 1 mm. longo, lineari-oblongo, breviore quam utriculus, viride, albo-marginato, acuto, immutabili fructu; stamine 1; stigmatibus 3; utriculis compressis, obovatis, rugulosis, fuliginosis, indehiscentibus, rostris acutis vel 3-dentatis; semine biconvexo, rotundo, nigro, nitido, circa 1 mm. diametro.

Annual; stems prostrate, angled, 1–2 dm. long, glabrous; leaves distichous, gray-green, 1–3.5 cm. long, to 3 mm. wide at the dilated apex, shallowly cleft with the lobes somewhat divergent, gradually attenuate below, midrib prominent below, the lateral veins inconspicuous or none; flowers monoecious, in short axillary spikes, the axes of which become corky-thickened and curved in fruit; bracts linear-lanceolate, 1.5 mm. long, exceeding the flowers; sepal 1, 1 mm. long, linear-oblong, shorter than the utricle, green, white-margined, acute; stamen 1; stigmas 3; utricle compressed, obovate, rugulose, dark brown, indehiscent, with pointed or shortly 3-toothed beak; seed biconvex, round, black, shining, about 1 mm. in diameter.

Type: Academy Bay, Indefatigable Island, *Howell No. 9063* (C. A. S. Herb. No. 203294).

This species is clearly related to *A. sclerantoides* Ands. which it resembles in its prostrate habit and linear leaves. From that species it differs not only in the flowers with single sepals and stamens, but also in the peculiar divergent lobes at the ends of the leaves, the dark colored, much wrinkled utricles, and the thickened curved axes of the axillary flower-clusters. The fruit is not readily deciduous; it is frequently held fast in the enlarged curved axis which breaks off with the fruit and which might serve as a buoyant means for dispersal. The species is known from two plants collected on a sandy flat near the shore of Academy Bay.

9. **Amaranthus squamulatus** (Ands.) Rob., Proc. Amer. Acad. 43: 22 (1907)

Scleropus squamulatus Ands., Stock. Akad. Handl. 162 (1854).
S. squarrulosus Ands. acc. Gray, Proc. Amer. Acad. 5: 169 (1861).
Amblogyne squarrulosa Gray, loc. cit.
Amaranthus squarrulosus Uline & Bray, Bot. Gaz. 19: 270 (1894).

Type locality. Chatham Island.

Insular distribution. ALBEMARLE: Tagus Cove, *Snodgrass & Heller!*, *Stewart!*, *Howell!* CHARLES: *Snodgrass & Heller;* Black Beach Road, *Howell!* CHATHAM: *Andersson.* DUNCAN: *Snodgrass & Heller; Howell!* INDEFATIGABLE: northern part, *Snodgrass & Heller!*, *Howell!;* northeast side, *Stewart!;* Conway Bay, *Howell!* JAMES: Sullivan Bay, *Howell!* JERVIS: *Baur; Howell!* NORTH SEYMOUR: *Snodgrass & Heller!*

Endemic.

10. **Amaranthus Anderssoni** Howell, nom. nov.

KEY TO THE FORMS OF *A. Anderssoni*

a. Stems spreading; bracts 1–2 mm. long; flowers about 2 mm. long, almost as broad, strongly urceolate.....10a. f. *typicus*
aa. Stems erect; bracts 1.5–2 mm. long; flowers 2–2.5 mm. long, tubular. .....10b. f. *erectus*

10a. **Amaranthus Anderssoni** f. **typicus** Howell, nom. nov.

Scleropus urceolatus Ands., Stock. Akad. Handl. 162 (1854). *Amblogyna urceolata* Ands., not Moq., Om. Galap.-öarnes Veg. 59 (1857). Not *Amaranthus urceolatus* Benth., Bot. Sulph. 158 (1844).

Type locality. Indefatigable Island in the vicinity of Conway Bay.

Insular distribution. Indefatigable: *Andersson.* Hood: Gardner Bay, *Howell!* James: James Bay, *Howell!;* Sullivan Bay, *Howell!*

Endemic.

This plant, which was described as an endemic Galapagian species by Andersson, was considered by subsequent workers in the flora of the islands as synonymous with *A. urceolatus* Benth., a species described from Guayaquil, Ecuador. The island plant is even more distinct from the mainland species than is *A. squamulatus* (Ands.) Rob. which has always been considered endemic. The peculiar spongy cushion developing in fruit at the base of the pistillate calyx at once separates *A. Anderssoni* from the mainland plant in which the base of the calyx becomes indurated (ex char.); and a further essential difference between the two is found in the male flowers which are two-staminate in the island plant and five-staminate in the one on the mainland (ex char.). The misinterpretation of the island plant has resulted largely from the lack of material, the collections made on the Templeton Crocker Expedition being the only ones known of the island plant aside from Andersson's original collection.

10b. **Amaranthus Anderssoni** f. **erectus** Howell, f. nov.

Caulibus erectis; bracteis 1.5–2 mm. longis; floribus 2–2.5 mm. longis, tubulato-urceolatis, longioribus quam latiores.

Stems erect; bracts 1.5–2 mm. long; flowers 2–2.5 mm. long, tubular-urceolate, longer than wide.

Type: Duncan Island, *Howell No. 9837A* (C. A. S. Herb. No. 203293).

This form was believed to be *A. squamulatus* (Ands.) Rob. when it was collected because in its erect slender habit it represents a marked change from typical *A. Anderssoni.* The flowers and bracts are also somewhat more elongated. The plant might represent a hybrid between the two species; but it can be properly placed in *A. Anderssoni* because of the hairy stem, broader leaves, and spongy tissue at the base of the fruiting perianth.

3. **IRESINE** L.

Iresine Edmonstonei Hook. f.,
Trans. Linn. Soc. 20: 190 (1847)

This plant, which with *I. elatior* Rich. is referred to the section *Rosea* of *Iresine* by both Moquin (DC. Prodr. 13, pt. 2: 313) and Schinz (Natur. Pflanz. III. 1a: 117), is known in the Galapagian flora only from a collection made by Darwin on Charles Island, the only collection cited by Hooker with the original description. Ac-

cording to Robinson (Proc. Amer. Acad. 38: 137), there is a specimen in the Gray Herbarium labelled "*Iresine Edmonstonei* Hook. f. Guayaquil? Mr. Edmonston," a specimen which agrees well with the description of the species. Hence, it is doubtful if the species is endemic to the Galapagos Islands, and there might be expressed some doubt as to the locality of the first collection.

4. LITHOPHILA Sw.

Key to the Species

a. Basal leaves rush-like and subterete.....1. *L. radicata*
aa. Basal leaves linear-oblanceolate, foliaceous.....2. *L. subscaposa*

1. **Lithophila radicata** (Hook. f.) Standl., Jour. Wash. Acad. Sci. 5: 396 (1915)

Alternanthera radicata Hook. f., Trans. Linn. Soc. 20: 261, 262 (1847).
A. acaulis Ands., Stock. Akad. Handl. 164 (1854).
Iresine radicata (Hook. f.) Kuntze, Rev. Gen. Pl. 542 (1891).

Type locality. Chatham Island.

Insular distribution. Charles: *Stewart!;* Black Beach, *Howell!* Chatham: *Darwin; Andersson!*, the type collection of *Alternanthera acaulis* Ands. Hood: *Snodgrass & Heller!*

Endemic.

This striking plant inhabits very dry rocky places in the lowlands. It bears a generic resemblance to the species of *Lithophila* in northern South America and the West Indies, *L. muscoides* Sw., but differs in the larger size of all its parts as well as in other details. By Schinz (Die Natür. Pflfam. III. 1b: 117), the genus *Lithophila* is merged with *Iresine;* but the plants are incongruous in *Iresine* and can be properly separated from that genus by the two fertile stamens and the three staminodia and by the compressed perianth.

2. **Lithophila subscaposa** (Hook. f.) Standl., Jour. Wash. Acad. Sci. 5: 396 (1915)

Alternanthera subscaposa Hook. f., Trans. Linn. Soc. 20: 189 (1847).
Iresine subscaposa (Hook. f.) Kuntze, Rev. Gen. Pl. 542 (1891).

Type locality. Charles Island.

This endemic species is either very rare or else it is not easily detected as it grows in the moist uplands amid the abundant vegetation of the wet zone. It is known from only two collections, the original one made by Darwin and a second one made by Stewart near the summit of Duncan Island at 1250 ft. The second collection

differs in one or two minor details of inflorescence and flower from the original description by Hooker and from the description by Moquin (DC. Prod. 13, pt. 2: 353); but, until the original collection can be compared, the differences are scarcely noteworthy.

5. PHILOXERUS R. Br.

Philoxerus rigidus (Rob. & Greenm.) Howell, comb. nov.

Alternanthera rigida Rob. & Greenm., Amer. Jour. Sci. 50: 143 (1895).

Lithophila rigida (Rob. & Greenm.) Standl., Jour. Wash. Acad. Sci. 5: 396 (1915).

Type locality. Orchilla Bay, James Island.

Insular distribution. JAMES: Orchilla Bay, *Baur!;* northeastern side, *Stewart!*

This remarkable Galapagian endemic is readily placed in the genus *Philoxerus* by its compressed perianth with the base of sterile tissue, by the five fertile stamens united at the base to form a short tube, by the absence of interstaminal appendages, and by the two elongate-triangular stigmas. The two-lobed stigma and the unappendaged stamen-tube separate the plant from *Alternanthera,* and the five fertile stamens and the modified base of the perianth separate the plant from *Lithophila.* Schinz (Die Natür. Pflfam. III. 1b: 117) merges *Philoxerus* and *Lithophila* in his section *Philoxerus* of *Iresine;* but it would seem that things are represented more nearly in the proper proportion to treat both *Philoxerus* and *Lithophila* as distinct genera: for not only are these several groups habitally dissimilar but they are rather readily distinguished by characters of the perianth and androecium.

The development of a low shrubby habit and shortened hardened leaves in *P. rigidus* marks an abrupt departure from the more usual type of plant found in *Philoxerus.* This sclerocauly and sclerophylly are the result of the direct influence of the desert conditions of the Galapagos Islands, as these conditions would affect a mesophytic prototype. The same end has been effected in *Mollugo Snodgrassii* Rob., a remarkable switch plant of the islands, also believed to be rather closely allied to herbaceous annuals of the mesophytic type. But in *P. rigidus* certain vegetative peculiarities of the group are still discernible beneath the strange aspect, such as the disposition of the pubescence in the axils of the leaves and in the inflorescence and the attachment of the opposite leaves by broad bases which completely surround the stems at the nodes.

6. ALTERNANTHERA Forsk.

The genus *Alternanthera*, which has received the most critical attention in this study, has a particularly high development in the Galapagos Islands, a development that is almost entirely endemic. Of the twenty species, subspecies, and forms that are accepted here, only one is considered not endemic, although there is a question about yet another. Most of the species are well marked and easily limited; but some of the species, especially those of the arid lowlands which have scoparious stems and linear leaves, are more intimately related and are not readily distinguished because of the variability of the plants. In the species of *Alternanthera* in the Galapagos Islands there are few instances where the morphology of the flower and the size of the flower-parts have been available for purposes of specific segregation. The type of foliage and its vesture and the position assumed by the flowers in the capitate inflorescences have been considered the most valuable structural features for a general grouping of species, and habit, as a character of secondary importance, has been very helpful. Some students may consider these characters too trivial to indicate acceptable species, but, nevertheless, they lend to the entities that they delimit a distinctive and specific aspect that is well correlated with insular distribution. It is believed that a much more accurate picture of the taxonomic status of the Galapagian *Alternantheras* is given, not by combining these groups into broad aggregates where nice distinctions are lacking and where geographic distribution is of no significance, but by treating these entities as species, some of which are more complex and variable within themselves, others of which are very distinctive in appearance and local in occurrence.

The generic name *Alternanthera* is taken for the group, replacing *Telanthera* to which most of the Galapagian species have been referred heretofore. *Telanthera*, established mainly on the relative lengths of the stamen-tube, filaments, and pseudostaminodia, is scarcely distinct from *Alternanthera* as a genus. *Achyranthes*, to which Standley referred most of the species, is to be returned to its generally accepted application with the designation of *Achyranthes aspera* L. as the type species, according to the list of standard species of Linnean genera proposed at the International Botanical Congress at Cambridge in 1930. This fixes *Alternanthera* as the name of the genus for which Standley, under the then existing American Code of Botanical Nomenclature, assumed *Achyranthes repens* L. as type.

Because of the confusion that has existed in the determination of many of the collections in the genus and because of differences of opinion on specimens, no specimens other than original collections have been cited unless they have been examined.

Key to the Species

a. Leaves narrowly linear to linear-oblong or linear-oblanceolate, 0.5–3 mm. wide (or 5 mm. wide in *A. glaucescens* and *A. flavicoma*).

b. Stems and leaves glabrous or if minutely pubescent soon glabrate.

c. Flowers closely and smoothly imbricated, densely covered with pale yellow hairs.....1. *A. nudicaulis*

cc. Flowers loosely imbricated or even subsquarrose, or if more closely adpressed, the head not smooth.

d. Leaves not fleshy or glaucescent (except in *A. filifolia glauca);* flowers frequently erect or spreading at the top of the head, the tips standing free, the flowers whitish to straw-color .....2. *A. filifolia*

dd. Leaves somewhat fleshy when fresh, glaucescent; flowers more closely imbricated, the tips incurved at the top of the head or subadpressed, pale yellowish.....3. *A. glaucescens*

bb. Stems and leaves densely or conspicuously pubescent, the pubescence subpersistent.

e. Leaves linear-oblanceolate or linear-oblong, 2–5 mm. wide or rarely wider; heads 4–5 mm. wide; flowers 3–3.5 mm. long, roughly imbricated, the tips free..4. *A. flavicoma*

ee. Leaves narrowly linear, 1–2 mm. wide; heads 3 mm. wide; flowers 2–2.5 mm. long, closely imbricated, the tips subadpressed.....5. *A. flosculosa*

aa. Leaves oblanceolate and elliptic to ovate or round, generally more than 5 mm. broad (the upper leaves of *A. Snodgrassii* are usually narrower and the smaller leaves of *A. nesiotes* are less than 5 mm. wide).

f. Flowers more or less adpressed or closely imbricated.

g. Stems and leaves glabrous and glaucous.....6. *A. galapagensis*

gg. Stems and leaves not glaucous, hirsutulose to tomentulose or subsericeous.

h. Leaves at least twice as long as broad, oblong or elliptic to oblanceolate.

i. Hairs on the stems much-branched, the pubescence hirsutulose and fulvous.....7. *A vestita*

ii. Hairs on the stems nearly or quite simple, the pubescence subsericeous and pale straw-color.....8. *A. Snodgrassii*

hh. Leaves nearly as broad as long to broader than long, broadly ovate to round and even transversely elliptical.

j. Bushy plants with erect or spreading stems; leaves to 4.5 cm. long.....9. *A. Helleri*

jj. Mat-like plant with stems prostrate from the top of a thick woody tap-root; leaves to 0.8 cm. long.....10. *A. nesiotes*

ff. Flowers loosely imbricated to arcuate-spreading or squarrose.

k. Sepals subequal and similar, generally more than 5 mm. long; stamen-tube and pseudostaminodia 5–6 mm. long; anthers 2 mm. long; shrubs to 2.5 m. tall... .....11. *A. echinocephala*

kk. Sepals not equal, dissimilar, less than 5 mm. long; stamen-tube and pseudostaminodia 3 mm. long; anthers 1 mm. long or less.

l. Arborescent shrub or low tree, 3–4 m. tall; leaves oblong, rounded at the apex; heads terminal, oblong.....12. *A. rugulosa*

ll. Trailing or bushy perennials to 1.5 m. tall, becoming woody at the base; leaves elliptic or lanceolate to ovate, generally acute, sometimes obtuse; heads axillary, about as broad as long.

m. Leaves elliptic to ovate-oblong, to 5.5 cm. long, 3–5-nerved; outer sepals spinose-acuminate.....13. *A. ficoidea*

mm. Leaves broadly elliptic to ovate, to 10 cm. long, 5–8-nerved; outer sepals acute to acuminate.....14. *A. halimifolia macrophylla*

1. **Alternanthera nudicaulis** (Hook. f.)

E. Christophersen, Nyt Mag. Naturvid. 70: 73 (1931)

Bucholtzia nudicaulis Hook. f., Trans. Linn. Soc. 20: 191 (1847).
Telanthera nudicaulis Moq. in DC., Prodr. 13, pt. 2: 369 (1849).
Achyranthes nudicaulis Standl., Jour. Wash. Acad. Sci. 5: 74 (1915).

Type locality. Charles Island.

Insular distribution. Abingdon: *Stewart!* Charles: *Darwin; Stewart!;* Post Office Bay, *Crocker!*, *Howell!;* Black Beach, *Howell!*

Endemic.

Andersson's collection from Charles Island (Gray Herb.) which has been referred to this species has been examined and is not typical because the flowers are not closely adpressed in the heads. Hence, the plant may be more closely related to *A. glaucescens* as the species are limited here. In fact, a critical comparison of this specimen and Andersson's type collection of *Telanthera strictiuscula* discloses no essential difference; and the suggestion is made here that there might have been a confusing of labels or specimens, and that Andersson's specimen labelled *T. nudicaulis* from Charles Island is actually *T. strictiuscula* from Chatham Island, at least as far as the specimen in the Gray Herbarium is concerned.

Also in the material in the Gray Herbarium is an excellent specimen of *A. nudicaulis* from the "Galapagos Islands" with mature heads, but the specimen is without definite locality or name of collector. The heads are 4-5 mm. wide and as much as 2 cm. long, and the flowers are closely and evenly adpressed and imbricated. Al-

though in young heads the bracts and sepals are densely yellowish-hairy, in these matured heads they are glabrate and light brown.

Stewart's collection (*No. 1405*) from Abingdon Island is not typical in that the ends of the branches are pubescent and the leaves are broad, but the heads and flowers correspond almost exactly to those of typical *A. nudicaulis* from Charles Island. It is probable that the Abingdon plant will be recognized later as a distinct form of *A. nudicaulis* when better vegetative specimens are obtained.

2. **Alternanthera filifolia** (Hook. f.) Howell, comb. nov.

Bucholtzia filifolia Hook. f., Trans. Linn. Soc. 20: 192 (1847).
Telanthera filifolia Moq. in DC., Prodr. 13, pt. 2: 368 (1849).
Achyranthes Hookeri Standl., Jour. Wash. Acad. Sci. 5: 74 (1915).

KEY TO THE SUBSPECIES OF *A. filifolia*

a. Heads 3–6 mm. wide, generally 3–7-glomerate at the ends of branchlets or sometimes only 1 or 2; leaves mostly 1–2 mm. wide.
  b. Stems not glaucous.
    c. Heads 3–4 mm. wide; flowers erect, the tips free but scarcely divergent.....2a. *typica*
    cc. Heads 4–6 mm. wide; flowers spreading or subsquarrose.....2b. *subsquarrosa*
  bb. Stems glaucous.....2c. *glauca*
aa. Heads 2.5–3 mm. wide, generally solitary, sometimes 2–3-glomerate.
  d. Leaves 1.5–4 mm. wide; heads 2.5–3 mm. wide, generally pearly-white; bracts and sepals acute.....2d. *margaritacea*
  dd. Leaves 3 mm. wide; heads 3 mm. wide, straw-color; bracts and sepals subacuminate.....2d. *sylvatica*

2a. **Alternanthera filifolia typica** Howell, nom. nov.

Bucholtzia filifolia Hook. f., l. c. *Telanthera filifolia* Moq., l. c. *Achyranthes Hookeri* Standl., l. c.

Type locality. James Island.

Insular distribution. ALBEMARLE: southern part (?), *Baur No. 293!;* 5 miles ne. of Webb Cove, *Howell!;* Cowley Bay, *Baur!, Stewart!;* Tagus Cove Mt., *Stewart!, Howell!* INDEFATIGABLE: southeastern side, *Stewart!;* Academy Bay, *Howell!* JAMES: *Darwin;* Orchilla Bay, *Baur!;* James Bay, *Howell!;* Sullivan Bay, *Howell!*

Endemic.

In localities not of the most arid sort, where the plants are shaded by brush or trees, the typical form with heads glomerate-congested

is frequently replaced by a form in which solitary heads are not infrequent. Since the aspect of such plants and the character of the leaves and heads are more like the typical form, such plants are referred here. The following specimens are of this character. Albemarle: southern part, *Baur No. 302!;* Villamil, *Stewart!*, *Howell!* Indefatigable: Academy Bay, *Howell!* Narborough: southern side, *Stewart!*

2b. **Alternanthera filifolia subsquarrosa** Howell, subspec. nov.

Caulibus divaricatis; foliis usque ad 5 cm. longis, 1–2.5 mm. latis; capitulis fere 3–7-glomeratis, 4–6 mm. latis; floribus subpatentibus vel subsquarrosis; longioribus sepalis 3–3.5 mm. longis; staminibus 2.5 mm. longis.

Stems divergently branched; leaves to 5 cm. long, 1–2.5 mm. wide; heads generally 3–7-glomerate, 4–6 mm. wide; flowers somewhat spreading or subsquarrose; longer sepals 3–3.5 mm. long, stamens 2.5 mm. long.

Type: James Bay, James Island, *Stewart No. 1413* (C. A. S. Herb. No. 132894; isotype in Gray Herb.). Stewart notes that the plant was "fairly abundant to 1200 ft." A second collection was made by Stewart at James Bay, *No. 1397* (!), and was reported as an occasional bush, 12 to 18 inches high, growing to an elevation of 2150 ft. A foliose specimen with very young heads from relatively moist slopes above the southeastern end of James Bay, *Howell No. 9685*, may belong here.

2c. **Alternanthera filifolia glauca** Howell, subspec. nov.

Caulibus ligneis, glaucis, multiramosis supra, internodis brevibus; foliis crassiusculis, subcoriaceis, leve pubescentibus, demum glabrescentibus, glaucescentibus, lineari-oblanceolatis, usque ad 2.5 cm. longis, 3 mm. latis, margine vix revolutis; capitulis 2–4-glomeratis, 8 mm. longis, 4 mm. latis, oblongo-conoideis, floribus inaequaliter imbricatis; bracteis 2 mm. longis; longioribus sepalis circa 3 mm. longis; staminibus 2 mm. longis.

Stems woody, glaucous, much-branched above, the internodes short; leaves thickish, subcoriaceous, lightly pubescent, becoming glabrate, glaucescent, linear-oblanceolate, to 2.5 cm. long, 3 mm. wide, margins scarcely revolute; heads generally 2–4-glomerate, 8 mm. long, 4 mm. wide, the flowers roughly imbricated; bracts 2 mm. long; the longer sepals about 3 mm. long; stamens 2 mm. long.

This distinctive plant, which is nearly specifically distinct as the species are accepted here, is known from only a single collection made on Brattle Island by Stewart, *No. 1408* (type, C. A. S. Herb. No. 132898; isotype in Gray Herb.). The character of the heads definitely relates *A. filifolia glauca* to *A. filifolia* rather than to *A. glaucescens* or *A. galapagensis*, the other glaucescent species in

the Galapagos Islands. It appears to be a development resulting from maritime influence in the variable series here placed in *A. filifolia*.

2d. **Alternanthera filifolia margaritacea** Howell, subspec. nov.

Caulibus divaricatis; foliis linearibus ad lineari-oblanceolatis, 1.5–4 mm. latis; capitulis globosis ad conicis, solitariis vel 2–3-glomeratis, margaritaceis, 2.5–3 mm. latis; floribus erectis, apicibus non adpressis; bracteis 1.5 mm. longis; longioribus sepalis circa 2 mm. longis; staminibus 1–1.5 mm. longis.

Stems divergently branched; leaves linear to linear-oblanceolate, 1.5–4 mm. wide, heads solitary or 2–3-glomerate, pearly-white, 2.5–3 mm. wide; flowers erect, the tips not adpressed; bracts 1.5 mm. long; the longer sepals about 2 mm. long; stamens 1–1.5 mm. long.

Type: Iguana Cove, Albemarle Island, *Howell No. 9416* (C. A. S. Herb. No. 203288). Other collections have been made at Iguana Cove by Snodgrass & Heller (!) and by Stewart (!). A young specimen was collected by Snodgrass & Heller (!) from southern Narborough Island at 2000 ft. and is perhaps referable here. In this the heads are a bit larger and the leaves broader than in the specimens from Iguana Cove.

2e. **Alternanthera filifolia sylvatica** Howell, subspec. nov.

Caulibus divaricatis; foliis angustato-oblanceolatis, 3–3.5 cm. longis, 3 mm. latis; capitulis fere solitariis, 3 mm. latis, stramineis; floribus primo patentibus, tandem subadpressis; bracteis 1.5–2 mm. longis; longioribus sepalis 2.5 mm. longis; staminibus 1.5 mm. longis.

Stems divergently branched; leaves slender-oblanceolate, 3–3.5 cm. long, 3 mm. wide; heads generally solitary, 3 mm. wide, straw-color; flowers spreading at first, later subadpressed; bracts 1.5–2 mm. long; the longer sepals 2.5 mm. long; stamens 1.5 mm. long.

Type: trail to Fortuna from Academy Bay, Indefatigable Island, *Howell No. 9140* (C. A. S. Herb. No. 203289). This was a much-branched shrub about 1 m. tall growing on a rocky slope in partial shade in the region between the dry lowlands and wet uplands. A collection by Svenson (!) from the shore of Academy Bay is referred here as a puberulent variant. In this collection, as in the type, the bracts and sepals are nearly acuminate.

3. **Alternanthera glaucescens** (Hook. f.) Howell, comb. nov.

Bucholtzia glaucescens Hook. f., Trans. Linn. Soc. 20: 191 (1847).
Telanthera glaucescens Moq. in DC., Prodr. 13, pt. 2: 369 (1849).
Achyranthes glaucescens Standl., Jour. Wash. Acad. Sci. 5: 74 (1915).

Key to the Forms of *A. glaucescens*

Leaves 2–3 (or 5) mm. wide, linear-oblanceolate.....3a. f. *typica*
Leaves 1–1.5 mm. wide, linear.....3b. f. *strictiuscula*

3a. **Alternanthera glaucescens** f. **typica** Howell, nom. nov.

Bucholtzia glaucescens Hook. f., l. c. *Telanthera glaucescens* Moq., l. c. *Achyranthes glaucescens* Standl., l. c.

Type locality. Chatham Island.

Insular distribution. Chatham: *Darwin; Andersson!;* Wreck Bay, *Stewart!, Howell!;* Sappho Cove, *Stewart!*

Endemic.

Stewart's collections from Wreck Bay were reported by him as *Telanthera flavicoma* Ands. because of the pubescence on the branchlets and young leaves. In spite of the emphasis placed on the character of pubescence in *A. flavicoma*, it would seem that these specimens are more properly considered puberulent variants of *A. glaucescens*, with which species they seem allied by the more rhombic-linear or elliptic-linear leaves, subcoriaceous in texture, and sparse on the branchlets. Baur's collection from the northern part of Chatham Island (!) is a specimen without leaves, but it is referred here on the character of the mature heads in which the flowers are not very closely and evenly adpressed.

3b. **Alternanthera glaucescens** f. **strictiuscula** (Ands.) Howell, comb. nov.

Telanthera strictiuscula Ands., Stock. Akad. Handl. 166 (1854). *T. angustata* Ands., Om. Galap.-öarnes Veg. 61, pl. 4, fig. 2 (1857). *Achyranthes strictiuscula* Standl., Jour. Wash. Acad. Sci. 5: 75 (1915).

Type locality. Chatham Island.

Insular distribution. Chatham: *Andersson!*, original collection of *Telanthera strictiuscula* Ands.; *A. Agassiz!; Snodgrass & Heller!*, intergrading to typical *A. glaucescens*.

Endemic.

Telanthera strictiuscula Ands., interpreted from a specimen of the original collection in the Gray Herbarium, appears to be a narrow-leaved form of *A. glaucescens*, and it can be connected to that species by a series of intergrading specimens. In fact, if the material in the pocket on the sheet in the Gray Herbarium is from the same plant as the mounted specimen, there is no doubt of the close relationship of the two species because of the greater width of the leaf-fragments and the character of the more mature heads enclosed therein. Even

if the pocket-material originated from a collection of typical *A. glaucescens*, wholly or in part, the mounted specimen with its narrow leaves would still appear best treated as a form of *A. glaucescens* because of the similarity of the heads in the two forms.

Alternanthera glaucescens through f. *strictiuscula* is closely related to *A. filifolia*. In fact, many of the collections cited in this work under *A. filifolia* have been referred by earlier students of the Galapagian flora to *Telanthera strictiuscula* Ands. Typical *A. filifolia* has the flowers more or less spreading in the head, and even in less typical forms the flowers have an unadpressed or uneven appearance. The flowers in *A. glaucescens* f. *typica* and f. *strictiuscula* are more evenly adpressed and the heads have a different aspect from those of the more atypical forms of *A. filifolia*. Further study and more extensive collections of *A. glaucescens* will determine whether it can be maintained distinct from *A. filifolia*.

After a critical study of the diagnoses of *Telanthera strictiuscula* Ands. and *T. angustata* Ands., names which Andersson considered synonymous, and after an examination of Andersson's figure of *T. angustata*, a question arose as to whether the names had been applied by Andersson to plants nearly enough alike to be considered the same, or whether two taxonomic entities were involved. The specimen of *T. strictiuscula* in the Gray Herbarium corresponds closely to the original description of the species as given by Andersson in Stock. Akad. Handl. p. 66; but this specimen, principally the leaves and inflorescence, does not correspond to the figure of *T. angustata* Ands. in Andersson's second work on the flora of the Galapagos Islands, Om Galap.-öarnes Veg. pl. 4, fig. 2, nor to the statement, l. c., p. 61, that the leaves are to 3 inches in length. On the mounted specimen referred to, there is no leaf over one inch in length and the heads are not on elongated "peduncles" as shown in the figure. Undoubtedly two collections from Chatham Island were used by Andersson, specimens unlike in appearance but probably representing merely extremes of branching and of leaf variation. The collection from Chatham Island by A. Agassiz (Gray Herb.) represents the form with more open branching and longer leaves. For a time it was thought that *T. angustata* Ands. might be *A. flosculosa* Howell, but the absence of pubescence in the former species (ex char., as far as *T. angustata* Ands. is concerned) and its abundance in the latter species led to the conclusion that *T. strictiuscula* Ands. and *T. angustata* Ands. are very nearly related forms, if not identical, and that to neither is *A. flosculosa* referable.

In his second work, Andersson was in undoubted error when he cites his collection from James Island instead of from Chatham Island (cf. Robinson, Fl. Galap. Is., p. 140). No reason for changing the name of the species from *strictiuscula* to *angustata* is given.

4. **Alternanthera flavicoma** (Ands.) Howell, comb. nov.

Telanthera flavicoma Ands., Stock. Akad. Handl. 166 (1854).
Achyranthes flavicoma Standl., Jour. Wash. Acad. Sci. 5: 74 (1915).

Type locality. Charles Island.

Insular distribution. ALBEMARLE: Villamil, *Stewart!* CHARLES: *Andersson; Stewart!* CHATHAM: Bassa Point, *Stewart!* DUNCAN: *Snodgrass & Heller!* GARDNER (near Hood): *Snodgrass & Heller!; Howell!* HOOD: *Baur!; Snodgrass & Heller!; Stewart!* INDEFATIGABLE: Academy Bay, *Stewart!* JERVIS: *Stewart!*

Endemic.

This species is closely related to *A. filifolia* and might be considered a pubescent variant of it. However, besides the commonly golden hairs which envelop the young growth, there is a tendency for the leaves to be wider and for the tips of the flowers to be less sharply acute. It is not always easy to distinguish between the two species but usually specimens can be rather readily placed.

Among the specimens that have been examined from the Gray Herbarium is a collection of *Alternanthera* labelled "S. Chili, J. G. Reynolds." Undoubtedly, it represents a plant closely related to the narrow-leaved species of *Alternanthera* of the Galapagos Islands and seems nearest to the present species. It is very improbable that a plant with the xerophytic characters which are found in this plant would occur in southern Chile, and it seems not impossible that the collection originated in the Galapagos Islands and has been mislabelled. This plant has been determined as *Telanthera nudicaulis* but it cannot be that species because the flowers are not smoothly adpressed in the heads and the leaves and branchlets are rather conspicuously pubescent.

From Abingdon Island come the collections most divergent from the usual type, *Snodgrass & Heller No. 826*, *Stewart No. 1387*, and *Stewart No. 1386*. In the first two specimens the leaves vary to 1 cm. wide, the flowers are a little more adpressed in the heads, and the anthers are only about 0.5 mm. long. In *Stewart No. 1386* the stems are noted as prostrate and there are roots at the nodes; and, although the leaves are as broad as in the other collections from Abingdon Island, the heads and flowers are more like the usual type and the anthers are 1 mm. long. For the present these are placed as atypical forms of *A. flavicoma* although they might be considered nearer to *A. Snodgrassii*.

5. **Alternanthera flosculosa** Howell, spec. nov.

Frutex multiramosus, 1–2 m. altus; ramulis pubescentibus; foliis angustato-linearibus, 1–6 cm. longis, 1–2 mm. latis, subsessilibus, dense et persistente flavescenti-pubescentibus subtus, subglabrescentibus supra; capitulis albidis, solitariis vel 2–3-glomeratis, oblongo-ovatis, 4–7 mm. longis, 3 mm. latis, dense pilosis; bracteis 1.5 mm. longis; longioribus sepalis circa 2 mm. longis, apicibus florum subadpressis; staminibus 1 mm. longis, breviter excedentibus pseudostaminodia.

Much-branched shrub, 1–2 m. tall; branchlets pubescent; leaves narrowly linear, 1–6 cm. long, 1–2 mm. wide, subsessile, densely and persistently yellowish-hairy below, subglabrescent above; heads whitish, solitary or 2–3-glomerate, oblong-ovate, 4–7 mm. long, 3 mm. wide, densely pilose; bracts 1.5 mm. long; longer sepals 2 mm. long, the tips of the flowers subadpressed; stamens 1 mm. long, barely exceeding the pseudostaminodia.

Collections. Chatham: Wreck Bay near the shore, *Howell No. 8604* (type, C. A. S. Herb. No. 203290); southwestern end, *Baur!* (seedling); Wreck Bay at 500 ft., *Stewart!*

Alternanthera flosculosa is most nearly related to *A. flavicoma* but appears amply distinct for specific recognition. Not only does the plant differ from *A. flavicoma* in its more slender heads and smaller flowers, but it is a definite shrub 1 to 2 m. tall instead of a scoparious herb from a woody base as is *A. flavicoma.*

6. **Alternanthera galapagensis** (Stewart) Howell, comb. nov.

Telanthera galapagensis Stewart, Proc. Calif. Acad. Sci., ser. 4, 1: 57 (1911).
Achyranthes galapagensis Standl., Jour. Wash. Acad. Sci. 5: 74 (1915).

This distinct species with its broad glaucous leaves is known only from the type specimen, collected on Gardner Island near Charles Island by J. R. Slevin (!), herpetologist on the Expedition of the California Academy of Sciences of 1905-1906.

7. **Alternanthera vestita** (Ands.) Howell, comb. nov.

Telanthera vestita Ands., Stock. Akad. Handl. 169 (1854).
Achyranthes vestita Standl., Jour. Wash. Acad. Sci. 5: 75 (1915).

Type locality. Indefatigable Island.

Insular distribution. Indefatigable: dry places in the middle regions, *Andersson;* south of Conway Bay, *Baur!;* north side, *Stewart!;* Academy Bay, *Stewart!*

Endemic.

In his original account of the species, Andersson reported it from Charles Island, but in his second work the locality was changed to Indefatigable Island, on which the plant has been recollected and to which its distribution appears to be restricted. Without doubt, Andersson's collection was made in the vicinity of Conway Bay at the northwest side of the island.

8. **Alternanthera Snodgrassii** (Rob.) Howell, comb. nov.

Telanthera Snodgrassii Rob., Proc. Amer. Acad. 38: 140 (1902).
Achyranthes Snodgrassii Standl., Jour. Wash. Acad. Sci. 5: 75 (1915).

Type locality. North Seymour Island.

Insular distribution. INDEFATIGABLE: Seymour Bay, *Wheeler, Rose & Beebe!;* north side, *Howell!* NORTH SEYMOUR: *Snodgrass & Heller!*, original collection; *Howell!* SOUTH SEYMOUR: *Howell!*, only one plant seen.

Endemic.

Alternanthera Snodgrassii was very abundant on the grassy flats of northern Indefatigable Island and North Seymour Island, and was not unattractive as it formed broad, loosely spreading, much-branched bushes. The species is closely related to *A. vestita* in the character of inflorescence and flowers, but the two can be readily distinguished by the very different types of vesture with which the young shoots are clothed. It is not always easy to distinguish *A. Snodgrassii* from *A. flavicoma*, especially in those forms of the latter where the leaves are somewhat broader than usual. But in *A. flavicoma* the flowers usually end abruptly and the heads have a thatched appearance; in *A. Snodgrassii* the flowers are more closely adpressed and the heads are relatively smooth. Moreover, *A. Snodgrassii* is usually widely and loosely branched and bears many more heads.

9. **Alternanthera Helleri** (Rob.) Howell, comb. nov.

Telanthera Helleri Rob., Proc. Amer. Acad. 38: 138 (1902).
Achyranthes Helleri Standl., Jour. Wash. Acad. Sci. 5: 74 (1915).

KEY TO THE FORMS OF *A. Helleri*

Leaves ovate, acute ..... 9a. f. *typica*
Leaves ovate to broadly ovate, obtuse ..... 9b. f. *obtusior*

9a. **Alternanthera Helleri** f. **typica** Howell, nom. nov.

Telanthera Helleri Rob., l. c. *Achyranthes Helleri* Standl., l. c.

The typical form of this species is known only from Culpepper Island where it was originally collected by Snodgrass and Heller (!) and subsequently by F. X. Williams (!), entomologist on the California Academy of Sciences Expedition of 1905-1906.

9b. **Alternanthera Helleri** f. **obtusior** (Rob.) Howell, comb. nov.

Telanthera Helleri var. *obtusior* Rob., Proc. Amer. Acad. 38: 139 (1902).

This form is readily distinguished from the typical form by the broader obtuse leaves. It is known only from Wenman Island where two collections have been made, the first by Snodgrass and Heller (!), the second by Stewart (!).

10. **Alternanthera nesiotes** Johnston,
Contrib. Gray Herb. n. s. 68: 83 (1923)

This rock-dweller, with its low trailing stems, small roundish leaves, and diminutive heads, is one of the most distinctive developments in *Alternanthera*. It was originally mistaken for a *Coldenia* and was reported as *C. fusca* (Stewart, Proc. Calif. Acad. Sci., ser. 4, 1: 126) so similar were the habital resemblances of the two plants. This remarkable species is known only from a single collection made by Stewart (!) at Cormorant Bay, Charles Island.

11. **Alternanthera echinocephala** (Hook. f.)
E. Christophersen, Nyt Mag. Naturvid. 70: 73 (1931)

Brandesia echinocephala Hook. f., Trans. Linn Soc. 20: 189 (1847).
Telanthera echinocephala Moq. in DC., Prodr. 13, pt. 2: 373 (1849).
T. argentea Ands., Stock. Akad. Handl. 168 (1854). *T. argentea robustior* Ands., l. c. 168. *T. argentea nudiflora* Ands., l. c. 169. *T. argentea bracteata* Ands., l. c. 169.
T. echinocephala robustior Ands., Om Galap.-öarnes Veg. 63 (1857). *T. echinocephala nudiflora* Ands., l. c. 63. *T. echinocephala bracteata* Ands., l. c. 63.
Achyranthes echinocephala Standl., Jour. Wash. Acad. Sci. 5: 74 (1915).

Type locality. Charles Island.

Insular distribution. Abingdon: *Baur!; Snodgrass & Heller!; Stewart!* Albemarle: southern part, *Baur!;* Villamil, *Stewart!;* trail to Santo Tomas, *Howell!;* Iguana Cove, *Snodgrass & Heller!, Stewart!;* Cowley Bay, *Stewart!* Barrington: *Snodgrass & Heller!* Charles: *Darwin; Snodgrass & Heller!;* Black Beach, *Howell!;* Post Office Bay, *Howell!* Chatham: *Andersson!; Snodgrass & Heller!;* southwestern end, *Baur!;* Wreck Bay, *Stewart!, Howell!* Duncan: *A. Agassiz!; Baur!; Snodgrass & Heller!; Howell!* Gardner (near Hood): *Snodgrass & Heller!; Howell!* Hood: *Baur!; Stewart!;* Gardner Bay, *Howell!* Indefatigable: northern part, *Snodgrass &*

Heller!; Seymour Bay, *Wheeler, Rose & Beebe!;* Conway Bay, *Howell!;* southeastern side, *Stewart!;* Academy Bay, *Stewart!, Howell!* James: *Stewart!;* James Bay, *Baur!, Snodgrass & Heller!, Stewart!, Howell!*

Endemic.

12. **Alternanthera rugulosa** (Rob.) Howell, comb. nov.

Telanthera rugulosa Rob., Proc. Amer. Acad. 38: 139 (1902).
Achyranthes rugulosa Standl., Jour. Wash. Acad. Sci. 5: 74 (1915).

Aside from its remarkable habit which is that of a low tree, *A. rugulosa* has excellent characters of foliage, inflorescence, and flowers which distinguish it from related species. It is known to us from only two collections, the original collected by Baur (!) and the second by Stewart (!), both from Chatham Island, the former from the southwestern end in the middle region, the latter from 1800 ft. above Wreck Bay.

13. **Alternanthera ficoidea** (L.) R. Br., Prodr. 1: 417 (1810)

Gomphrena ficoidea L., Sp. Pl. 225 (1753).
Telanthera ficoidea Moq. in DC., Prodr. 13, pt. 2: 363 (1849).

A plant, undoubtedly referable to this species, was collected by Svenson (!) on Indefatigable Island, about 3 miles west of Academy Bay, at an elevation of 300 ft. The plant was so different from other species in the islands that it was tentatively named as new by Svenson, but he later referred it to *A. ficoidea.* In a letter regarding the plant, he points out that the main difference between his plant and the continental forms is found in the length of the stamens and the relative length of the stamens and the pseudostaminodia. The anthers of the island plant are 0.5 to 0.75 mm. long and the pseudostaminodia are a little shorter than the tips of the anthers; in the continental material that has been examined the anthers are about 1 mm. long and the pseudostaminodia equal the stamens or exceed them by as much as 0.5 mm. These differences can probably be considered within the range of specific variation of *A. ficoidea.* Svenson notes his collection as "somewhat dimorphic" but the two specimens mounted on the sheet which has been examined are not believed to be the same species. The small-leaved, flowering plant is what is here referred to *A. ficoidea;* the large-leaved, budding plant is what is placed with the lowland variants of *A. halimifolia macrophylla.* Further critical field study must be made to determine whether these two types of plants should be referred to the same or to two different species.

Alternanthera ficoidea was originally described from tropical America, and is widely distributed from the West Indies and Mexico to Argentina.

14. **Alternanthera halimifolia** (Lam.) Standl. **macrophylla** Howell, subspec. nov.

Herba perennis, caulibus repentibus et radicantibus vel erectis suffruticosis, 0.5–1.5 m. altis, hirsutulosis trichomis stellatis, glabrescentibus; foliis ellipticis ad ovatis, fere 2–10 cm. longis, 1–6 cm. latis, subhirsutulosis utrinque, densius infra, glabrescentibus supra, obtusis acutisve, nervis fere prominentibus, nervis lateralibus 5–8, petiolis 0.3-2.5 cm. longis; capitulis axillaribus, saepe solitariis vel interdum glomeratis, 4–8 mm. longis, circa eodem latitudine, floribus laxe imbricatis vel subdivergentibus, non arcuatis, subfuscis, bracteis 3–3.5 mm. longis; sepalis exterioribus 4–5 mm. longis, glabris vel pubescentibus; staminibus 2.5–4 mm. longis, antheris 1 mm. longis, pseudostaminodiis filamentis vix longioribus vel staminibus longitudine fere aequalibus, laciniatis.

Stems spreading and rooting or erect and forming bushes 0.5–1.5 m. tall, hirsutulose with stellate hairs, becoming glabrate; leaves elliptic to ovate, generally 2–10 cm. long, 1–6 cm. wide, subhirsutulose on both sides at first but denser below, above soon glabrate, obtuse or acute, the nerves generally prominent, the lateral nerves mostly 5–8, petioles 0.3–2.5 cm. long; heads frequently solitary or sometimes glomerate, nearly as broad as long, 4–8 mm. long, the flowers loosely imbricated or subdivergent, not arcuate, grayish-brown; bracts 3–3.5 mm. long; outer sepals 4–5 mm. long, the pseudostaminodia equalling the filaments or nearly equalling the stamens, laciniate.

Type: Villamil Mt. above Santo Tomas, Albemarle Island, *Howell No. 8985* (C. A. S. Herb. No. 203286).

Insular distribution. Albemarle: Villamil Mt., *Stewart!*, *Howell!* Chatham: *Stewart!* Indefatigable: southeastern side, *Stewart!;* northwestern side, *Stewart!;* above Academy Bay, *Stewart!*, *Svenson!*, *Howell!;* summit of Mt. Crocker, *Howell!*

Endemic.

After a critical comparison of the Galapagian material that has been referred to *A. halimifolia* with a number of specimens from the west coast of South America, it has appeared best to treat the island plant as a variable subspecies of the mainland plant. The leaves on the island plant average much larger, the stems are less branched, and the heads are always axillary. The flowers are more loosely arranged in the heads of the island plant although there is considerable variation in the compactness of the inflorescence in the continental forms. The most constant difference is found in the pseudostaminodia which in the mainland plant usually exceed the stamens by a considerable margin; in the island plant the pseudostaminodia equal the filaments but rarely reach the tips of the stamens.

The variation of habit and aspect found in subspecies *macrophylla* is considerable, seemingly in direct response to the immediate envir-

onment and available water supply. In the rain forests on the windward side of the higher islands, where the plant is especially abundant and characteristic, it becomes bushy and 1 to 1.5 m. tall and bears large ovate or ovate-lanceolate leaves with the blades as much as 10 cm. long and 6 cm. wide. The flower-parts are also larger in specimens from the rain forests. Above the rain forest in the more arid grassland of the island summits, the plant assumes a trailing habit, growing along the ground or clambering among low shrubs and bushy herbs. The stems and leaves of these plants are generally more densely pubescent and the leaves are not so large as those of the plants from the rain forest. The flowers are also smaller. The greatest reduction in leaf-size occurs along the lower edge of the forest belt where it approaches the lowland deserts or on the lee-side of the islands where the rainfall of the dry season tends to be intermittent. It is here that forms occur which in aspect and leaf-size most nearly correspond to the material which has been studied from the west coast of South America. The leaves are generally less than 4 cm. long and about half as wide, and the dense pubescence of the young shoots is relatively persistent. Just as in the summit regions, the flowers of these lowland plants are smaller than are those of plants in the rain forest. These ranging variations, seemingly so dependent on edaphic and climatic factors and so evenly connected with one another in the series of island specimens which has been studied, have appeared best treated as a single variable entity.

From the higher slopes of James Island above James Bay, Stewart obtained plants of this relationship with leaves narrower than is usual and somewhat elongated (*Stewart Nos. 1396* and *1416!*). The leaves are reminiscent of the wider type of leaves found in *A. flavicoma;* but the heads and flowers of these specimens are not like those in *A. flavicoma*, nor are they like the heads and flowers in *A. ficoidea* which also has leaves narrower than those of typical *A. halimifolia macrophylla.*

Although the name *Alternanthera halimifolia* (Lam.) Standl. is taken for the species, the concept is not believed to be identical with *Achyranthes halimifolia* Standley of the N. A. Fl. (21: 139) or with *Alternanthera halimifolia* Standley in Pittier's Man. Pl. Usual. Venez. (145. 1926), where the combination was first made. If *Telanthera Crucis* (Vahl) Moq. and *Telanthera flavogrisea* Urb. (which are probably synonomous) of the West Indian region are properly interpreted by the writer, there would seem to be no place for them in *Alternanthera halimifolia* as the species is here accepted.

7. **FROELICHIA** Moench

Key to the Species

a. Inflorescence rather strictly branched, the flowers in dense rounded or oblong clusters, the rhachis long-woolly.

b. Inflorescence not interrupted; perianth 4 mm. long, the perianth-segments exceeding the stamen-tube by at least 1 mm.; lobes of the stamen-tube broadly oblong, more than half as broad as long, rounded at apex; in fruit the perianth-tube developing wings at least half as broad as the tube.....1. *F. nudicaulis*

bb. Inflorescence frequently interrupted; perianth 3–3.5 mm. long, the perianth-segments nearly equalled by the stamen-tube; lobes of the stamen-tube oblong, about half as broad as long, at the apex rounded or emarginate; in fruit the perianth-tube nearly or quite without wings .....2. *F. lanigera*

aa. Inflorescence loosely branched, spicate, the flowers more or less scattered or if congested the end of the inflorescence acute, the rhachis not woolly or sparsely woolly in subspecies *alata*..3. *F. juncea*

1. **Froelichia nudicaulis** Hook. f., Trans. Linn. Soc. 20: 192 (1847)

Key to the Subspecies of *F. nudicaulis*

a. Stems subglabrous or weakly lanate; spike to 3 cm. long; longer bractlet 3–4 mm. long; perianth densely lanate.

b. Stems slender, elongate, divergently branched, glabrous or nearly so; spike oblong, 1–3 mm. long; longer bractlet 3–3.5 mm. long.....1a. *typica*

bb. Stems lower and stouter, more strictly erect and broom-like, somewhat lanate; spike capitate, about 0.5 cm. long; longer bractlet 4 mm. long.....1b. *curta*

aa. Stems pilose; spike to 6 cm. long; bractlets 2–2.5 mm. long; perianth almost glabrous.....1c. *longispicata*

1a. **Froelichia nudicaulis typica** Howell, nom. nov.

F. nudicaulis Hook. f., l. c.

Type locality. Charles Island.

Insular distribution. Charles: *Darwin; Andersson.* Chatham: *Andersson.* James: James Bay, *Stewart!*

Endemic.

1b. **Froelichia nudicaulis curta** Howell, subspec. nov.

Caulibus ad 3 dm. altis, substricte erectis et scopariis, sublanatis; spica capitata, circa 0.5 cm. longa; longiore bracteola 4 mm. longa.

Stems to 3 dm. tall, substrictly erect, broom-like, sublanate; spike capitate, about 0.5 cm. long; longer bractlet 4 mm. long.

Type: from the sides and top of Duncan Island, *Stewart No. 1366* (C. A. S. Herb. No. 133009).

The superficial aspect of this plant is that of *F. lanigera* Ands., under which name it was reported by Stewart (Proc. Calif. Acad. Sci. ser. 4, 1: 56. 1911); but the technical characters of the flower and of the wings developed on the fruiting perianth-tube relate the plant definitely to *F. nudicaulis.*

1c. **Froelichia nudicaulis longispicata** (Christophersen) Howell, comb. nov.

F. nudicaulis var. *longispicata* Christophersen, Nyt Mag. Naturvid. 70: 74 (1930).

This distinctive *Froelichia* is known only from the original collection which was made by Miss Rorud at Turtle Bay, Indefatigable Island. Material has not been seen, the characters on which it is based in this work being taken from the original description.

2. **Froelichia lanigera** Ands., Om Galap.-öarnes Veg. 63 (1857)

KEY TO THE SUBSPECIES OF *F. lanigera*

a. Stems lower and stouter, erect and broom-like; spikes oblong-capitate or shorter, the flowers usually 10 or more.....2a. *typica*

aa. Stems more elongate and slender; spikes capitate, less than 10-flowered, mostly about 5-flowered.....2b. *scoparia*

2a. **Froelichia lanigera typica** Howell, nom. nov.

F. lanigera Ands., l. c. *F. lanata* Ands., l. c., pl. 3, fig. 1.

Type locality. Albemarle Island, probably in the vicinity of Tagus Cove.

Insular distribution. ALBEMARLE: *Andersson;* Tagus Cove, *Snodgrass & Heller;* Tagus Cove Mt., *Stewart!, Howell!;* Cowley Bay, *Stewart!*

Endemic.

2b. **Froelichia lanigera scoparia** (Rob.) Howell, comb. nov.

F. scoparia Rob., Proc. Amer. Acad. 38: 136 (1902).

Type locality. Narborough Island, southern part at 2000 ft.

Insular distribution. Narborough: southern part, *Snodgrass & Heller!;* northern side, *Stewart!*, perhaps nearer the typical subspecies because of the more numerous flowers in the spikes.

Endemic.

3. **Froelichia juncea** Rob. & Greenm., Amer. Jour. Sci. 50: 143 (1895)

Key to the Subspecies of *F. juncea*

a. Stems and rhachis sparsely hairy or subglabrous; perianth 2–3 mm. long, the lobes about 1.5 mm. long, glabrous or nearly so; stamen-tube 2 mm. long; in fruit the perianth-tube without wings or with thick narrow wings.....3a. *typica*

aa. Stems and rhachis somewhat hairy or subtomentulose; perianth 4 mm. long, the lobes about 2 mm. long, tomentulose; stamen-tube 3 mm. long; in fruit the perianth-tube developing wings about 1 mm. broad.....3b. *alata*

3a. **Froelichia juncea typica** Howell, nom. nov.

F. juncea Rob. & Greenm., l. c.

Type locality. Southern part of Albemarle Island.

Insular distribution. Albemarle: southern part, *Baur;* Cowley Bay Mt., *Snodgrass & Heller;* Tagus Cove Mt., *Snodgrass & Heller, Howell!;* Villamil near sea level, *Stewart!;* trail to Santo Tomas, *Howell!*

Endemic.

The type was said to have been "collected on South Albemarle and Barrington Islands," but the occurrence of the species on Barrington Island is probably to be considered an error. Barrington Island is omitted by Robinson from his list of localities for *F. juncea* in his Flora of the Galapagos Islands.

3b. **Froelichia juncea alata** Howell, subspec. nov.

Caulibus et rachibus subpubescentibus vel subtomentulosis; perianthio 4 mm. longo, lobis circa 2 mm. longis, tomentulosis; tubo staminum 3 mm. longo; fructu tubo perianthii alato, alis circa 1 mm. latis.

Stems and rhachis somewhat hairy or subtomentulose; perianth 4 mm. long, the lobes about 2 mm. long, tomentulose; stamen-tube 3 mm. long; in fruit the perianth-tube developing wings about 1 mm. broad.

Type: southeastern side of Indefatigable Island at 450 ft., *Stewart No. 1363* (C. A. S. Herb. No. 203291).